RECEIVED MR 57 500K AUG 1 5 2000 SEQUENCE LISTING TECH CENTER 1600/2900 eas Walter 0> Rufer, Sauer, Brian Lee <120 $\frac{1}{2}$ Method for Selecting Recombinase Variants with Altered Specificity <130> OMRF 178 <140> 09/544,045 <141> 2000,04-06 <150> 60/127,977 <151> 1999-04-09 <160> 68 <170> PatentIn Vèr. 2.1 <210> 1 <211> 343 <212> PRT <213> Artificial Sequênce : <220> <223> Description of Artificial Sequence: Cre <400> 1 Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Val 10 Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Asp Met Phe Arg Asp Arg Gln Ala Phe Ser Glu His Thr \Trp Lys Met Leu Leu Ser Val 35 Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu\Asn Asn Arg Lys Trp Phe 60

55 50

Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Lew Leu Tyr Leu Gln Ala 70 65

Arg Gly Leu Ala Val Lys Thr Ile Gln Gln His Lev Gly Gln Leu Asn 85

Met Leu His Arg Arg Ser Gly Leu Pro Arg Pro Ser Asp Ser Asn Ala

100 105 110

| | | | 100 | | | | | | | | | | | | |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Val | Ser | Leu 115 | Val | Met | Arg | Arg | Ile 120 | Arg | Lys | Glu | Asn | Val 125 | Asp | Ala | Gly |
| Glu | Arg 130 | Ala | Lys | Gln | Ala | Leu 135 | Ala | Phe | Glu | Arg | Thr 140 | Asp | Phe | Asp | Gln |
| Val 145 | Arg | Ser | Leu | Met | Glu 150 | Asn | Ser | Asp | Arg | Cys 155 | Gln | Asp | Ile | Arg | Asn 160 |
| Leu | Ala | Phe | Leu | Gly 165 | Ile | Ala | Tyr | Asn | Thr 170 | Leu | Leu | Arg | Ile | Ala 175 | Glu |
| Ile | Ala | Arg | Ile 180 | Arg | Val | Lys | Asp | Ile 185 | Ser | Arg | Thr | Asp | Gly 190 | Gly | Arg |
| Met | Leu | Ile 195 | His | Ile | Gly | Arg | Thr 200 | Lys | Thr | Leu | Val | Ser 205 | Thr | Ala | Gly |
| Val | Glu 210 | Lys | Ala | Leu | Ser | Leu 215 | Gly | Val | Thr | Lys | Leu 220 | Val | Glu | Arg | Trp |
| Ile 225 | Ser | Val | Ser | Gly | Val 230 | Ala | Asp | Asp | Pro | Asn 235 | Asn | Tyr | Leu | Phe | Cys 240 |
| Arg | Val | Arg | Lys | Asn 245 | Gly | Val | Ala | Ala | Pro 250 | Ser | Ala | Thr | Ser | Gln 255 | Leu |
| Ser | Thr | Arg | Ala 260 | Leu | Glu | Gly | Ile | Phe 265 | Glu | Ala | Thr | His | Arg 270 | Leu | Ile |
| Tyr | Gly | Ala 275 | Lys | Asp | Asp | Ser | Gly 280 | Gln | Arg | Tyr | Leu | Ala 285 | Trp | Ser | Gly |
| His | Ser 290 | | Arg | Val | Gly | Ala 295 | Ala | Arg | Asp | Met | Ala 300 | | Ala | Gly | Val |
| Ser 305 | Ile | Pro | Glu | Ile | Met 310 | Gln | Ala | Gly | Gly | Trp 315 | | Asn | Val | Asn | Ile 320 |
| Val | Met | Asn | Tyr | Ile 325 | Arg | Asn | Leu | Asp | Ser 330 | | Thr | Gly | Ala | Met 335 | |

Arg Leu Leu Glu Asp Gly Asp 340

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| Repeat Sequence | |
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| (223) If the 51000 1 C and | |
| <400> 2 | |
| nnnacnncgt ata | 13 |
| | |
| | |
| <210> 3 | |
| <211> 34 | |
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| <213> Artificial Sequence | |
| <220> | |
| <pre><220> <223> Description of Artificial Sequence: variant lox</pre> | |
| sites | |
| | |
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| either A, G, C, or T | |
| | |
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| <211> 33 <212> DNA | |
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| sites | |
| 400. | |
| <400> 4 | 33 |
| gatacaacgt atataccttt ctatacgttg tat | |
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| <210> 5 | |
| <211> 34 | |
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<213> Artificial Sequence
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<223> Description of Artificial Sequence: Specific and
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                                                                    34
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<211> 8
<212> DNA
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<223> Description of Artificial Sequence:
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<400> 6
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 <223> Description of Artificial Sequence: Primer
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 <223> Description of Artificial Sequence: Primer
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| <220> <223> Description of Artificial Sequence: primer | |
| <400> 9 atatataagc ttatcattta cgcgttaatg g | 31 |
| <210> 10 <211> 33 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: primer | |
| <400> 10 ataagcggcc gctgagcttg gctgttttgg cgg | 33 |
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| <210> 12 <211> 30 <212> DNA <213> Artificial Sequence | |
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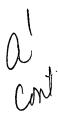
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| gtcaag | ctag ctagcaggtt tcccgactgg | 30 |
| | | |
| <210> | 13 | |
| <211> | | |
| <212> | | |
| <213> | Artificial Sequence | |
| | | |
| <220> | | |
| <223> | Description of Artificial Sequence: primer | |
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| | regge egeagatete etetagagte gacetg | 36 |
| acaccg | legge egougueere erecugugee guoorg | |
| | | |
| <210> | 14 | |
| <211> | 20 | |
| <212> | | |
| <213> | Artificial Sequence | |
| <0.00× | | |
| <220> | Description of Artificial Sequence: primer | |
| \ZZ J/ | bescription of Artificial bequence. Primer | |
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| tttggg | gctag cgaattcgag | 20 |
| | | |
| 0.1.0 | | |
| <210> | | |
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| 12101 | | |
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| <210> | 16 | |
| <211> | | |
| <212> | | |
| <213> | Artificial Sequence | |
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|--|----|
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| <210> 18 <211> 21 <212> DNA <213> Artificial Sequence | |
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| <400> 18 tetgegttet gatttaatet g | 21 |
| <210> 19 <211> 18 <212> DNA <213> Artificial Sequence | |
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| | |
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| <212> DNA | |
| | |
| <213> Artificial Sequence | |
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| <223> Description of Artificial Sequence: primer | |
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| <400> 21 | |
| ttgctggata gtttttactg cc | 22 |
| tagotaggata geotetating of | |
| | |
| | |
| <210> 22 | |
| <211> 45 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| • | |
| <220> | |
| | |
| <223> Description of Artificial Sequence: primer | |
| | |
| <400> 22 | |
| getatcaact egegeeetgg gagggatttt tgaageaact eateg | 4.5 |
| | |
| | |
| <210> 23 | |
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| | |
| <212> DNA | |
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| <223> Description of Artificial Sequence: primer | |
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| gagttgcttc aaaaatccct cccagggcgc gagttgatag ctggc | 4.5 |
| gayttyotto aaaaattoot oocayyyoyo yayttyatay otyyo | 7. |
| | |
| | |
| <210> 24 | |
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| <212> DNA | |
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| <220> | |
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gctggttagc accgeaggtg tagagaagge acttagtctg ggggtaacta aactggtcga 720
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atacctggcc tggtctggac acagtgcccg tgtcggagcc gcgcgagata tggcccgcgc 960
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gaaaatgett etgteegttt geeggtegtg ggeggeatgg tgeaagttga ataaceggaa 240
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egggetgeca egaceaagtg acageaatge tgtttcaetg gttatgegge ggateegaaa 420
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 cgaccaggtt cgttcactca tggaaaatag cgatcgctgc caggatatac gtaatctggc 540
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 gctggttagc accgcaggtg tagagaaggc acttagcctg ggggtaacta aactggtcga 720
 gcgatggatt tccgtctctg gtgtagctga tgatccgaat aactacctgt tttgccgggt 780
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<223> Description of Artificial Sequence: mxoxox3

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<223> Description of Artificial Sequence: mxoxox4

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gaaaatgctt ctgtccgttt gccggtcgtg ggcggcatgg tgcaagttga ataaccggaa 240
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cagaaaaaat ggtgttgccg cgccatctgc caccagccag ctatcaactc gcgccctggg 840
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atacctggcc tggtctggac acagtgcccg tgtcggagcc gcgcgagata tggcccgcgc 960
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Cmt

<220>

13

<223> Description of Artificial Sequence: mxoxox6

<400> 34 tttgggctag cgaattcgag ctcggtaccc ggggatcctc tagactgagt gtgaaatgtc 60 caatttactg accgtacacc aaaatttgcc tgcattaccg gtcgatgcaa cgagtgatga 120 ggttcgcaag aacctgatgg acatgttcag ggatcgccag gcgttttctg agcatacctg 180 gaaaatgctt ctgtccgttt gccggtcgtg ggcggcatgg tgcaagttga ataaccggaa 240 atggtttccc gcagaacctg aagatgttcg cgattatctt ctatatcttc aggcgcgcgg 300 totggcagta aaaactatoo agcaacattt gggccagota aacatgotto atogtoggto 360 cgggctgcca cgaccaagtg acagcaatgc tgtttcactg gttatgcggc ggatccgaaa 420 agaaaacgtt gatgccggtg aacgtgcaaa acaggctcta gcgttcgaac gcactgattt 480 cgaccaggtt cgttcactca tggaaaatag cgatcgctgc caggatatac gtaatctggc 540 atttctgggg attgcttata acaccctgtt acgtatagcc gaaattgcca ggatcagggt 600 taaaqatatc tcacqtactq acggtgggag aatgttaatc catattggca gaacgaaaac 660 gctggttagc accgcaggtg tagagaaggc acttagcctg ggggtaacta aactggtcga 720 gcgatggatt tccgtctctg gtgtagctga tgatccgaat aactacctgt tttgccgggt 780 cagaaaaaat ggtgttgccg cgccatctgc caccagccag ctatcaactc gcgccctggg 840 agggattttt gaagcaactc atcgattgat ttacggcgct aaggatgact ctggtcagag 900 ataccaggee tggtetggae acagtgeeeg tgteggagee gegegagata tggeeegege 960 tggagtttca ataccggaga tcatgcaagc tggtggctgg tccaatgtaa atattgtcat 1020 gaactatate egtaacetgg atagtgaaac aggggcaatg gtgegeetge tggaagatgg 1080 cgattagcca ttaacgcgta aatgataagc ttggctgttt tggcggatga gagaagattt 1140 1172 tcagcctgat acagattaaa tcagaacgca ga <210> 35 <211> 343 <212> PRT <213> Artificial Sequence <220> <223> Description of Artificial Sequence: mxoxox1 <400> 35 Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Val 10 5 Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Ala Met Phe Arg 25 20 Asp Arg Gln Ala Phe Ser Glu His Thr Trp Lys Met Leu Leu Ser Val

75 70 65 Arg Gly Leu Ala Val Lys Thr Ile Gln Gln His Leu Gly Gln Leu Asn

Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Leu Leu Tyr Leu Gln Ala

40

55

Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu Asn Asn Arg Lys Trp Phe

35

50

45

80

| Met | Leu | His | Arg 100 | Arg | Ser | Gly | Leu | Pro 105 | Arg | Pro | Ser | Asp | Ser 110 | Asn | Ala |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Val | Ser | Leu 115 | Val | Met | Arg | Arg | Ile 120 | Arg | Lys | Glu | Asn | Val 125 | Asp | Ala | Gly |
| Glu | Arg 130 | Ala | Lys | Gln | Ala | Leu 135 | Ala | Phe | Glu | Arg | Thr 140 | Asp | Phe | Asp | Gln |
| Val 145 | Arg | Ser | Leu | Met | Glu 150 | Asn | Ser | Asp | Arg | Cys 155 | Gln | Asp | Ile | Arg | Asn 160 |
| Leu | Ala | Phe | Leu | Gly 165 | Ile | Ala | Tyr | Asn | Thr 170 | Leu | Leu | Arg | Ile | Ala 175 | Glu |
| Ile | Ala | Arg | Ile 180 | Arg | Val | Lys | Asp | Ile 185 | Ser | Arg | Thr | Asn | Gly 190 | Gly | Arg |
| Met | Leu | Ile 195 | His | Ile | Gly | Arg | Thr 200 | Lys | Thr | Leu | Val | Ser 205 | Thr | Ala | Gly |
| Val | Glu 210 | Lys | Ala | Leu | Ser | Leu 215 | Gly | Val | Thr | Lys | Leu 220 | Val | Glu | Arg | Trp |
| Ile 225 | Ser | Ile | Ser | Gly | Val 230 | Ala | Asp | Asp | Pro | Asn 235 | Asn | Tyr | Leu | Phe | Cys 240 |
| Arg | Val | Arg | Lys | Asn 245 | Gly | Val | Ala | Ala | Pro 250 | Ser | Ala | Thr | Ser | Gln 255 | Leu |
| Ser | Thr | Arg | Ala 260 | Leu | Gly | Gly | Ile | Phe 265 | Glu | Ala | Thr | His | Arg 270 | Leu | Ile |
| Tyr | Gly | Ala 275 | Lys | Asp | Asp | Ser | Gly 280 | Gln | Arg | Tyr | Leu | Ala 285 | Trp | Ser | Gly |
| His | Ser 290 | Ala | Arg | Val | Gly | Ala 295 | Ala | Arg | Asp | Met | Ala 300 | Arg | Ala | Gly | Val |
| Ser 305 | Ile | Pro | Glu | Ile | Met 310 | Gln | Ala | Gly | Gly | Trp 315 | Thr | Asn | Val | Asn | Ile 320 |
| Val | Met | Asn | Tyr | Ile 325 | Arg | Asn | Leu | Asp | Ser 330 | | Thr | Gly | Ala | Met 335 | Val |
| Arg | Leu | Leu | Glu | Asp | Gly | Asp | | | | | | | | | |

<210> 36 <211> 343 <212> PRT <213> Artificial Sequence <220> <223> Description of Artificial Sequence: mxoxox2 <400> 36 Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Val Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Asp Met Phe Arg Asp Arg Gln Ala Phe Ser Glu His Thr Trp Lys Met Leu Leu Ser Val Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu Asn Asn Arg Lys Trp Phe Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Leu Leu Tyr Leu Gln Ala Arg Gly Leu Ala Val Lys Thr Ile Gln Gln His Leu Gly Gln Leu Asn Met Leu His Arg Arg Ser Gly Leu Pro Arg Pro Ser Asp Ser Asn Ala Val Ser Leu Val Met Arg Arg Ile Arg Lys Glu Asn Val Asp Ala Gly Glu Arg Ala Lys Gln Ala Leu Ala Phe Gly Arg Thr Asp Phe Asp Gln Val Arg Ser Leu Met Glu Asn Ser Asp Arg Cys Gln Asp Ile Arg Asn Leu Ala Phe Leu Gly Ile Ala Tyr Asn Thr Leu Leu Arg Ile Ala Glu Ile Ala Arg Ile Arg Val Lys Asp Ile Ser Arg Thr Asp Gly Gly Arg

Met Leu Ile His Ile Gly Arg Thr Lys Thr Leu Val Ser Thr Ala Gly 195 200 205 Val Glu Lys Ala Leu Ser Leu Gly Val Thr Lys Leu Val Glu Arg Trp 215 Ile Ser Val Ser Gly Val Ala Asp Asp Pro Asn Asn Tyr Leu Phe Cys 225 230 235 Arg Val Arg Lys Asn Gly Val Ala Ala Pro Ser Ala Thr Gly Gln Leu 245 250 Ser Thr Arg Ala Leu Gly Gly Ile Phe Glu Ala Thr His Arg Leu Ile 260 265 270 Tyr Gly Ala Lys Asp Asp Ser Gly Gln Arg Tyr Leu Ala Trp Ser Gly 280 His Ser Ala Arg Val Gly Ala Ala Arg Asp Met Ala Arg Ala Gly Val 295 Ser Ile Pro Glu Ile Met Gln Ala Gly Gly Trp Thr Asn Val Asn Ile 310 315 Val Met Asn Tyr Ile Arg Asn Leu Asp Ser Glu Thr Gly Ala Met Val 325 330 Arg Leu Leu Glu Asp Gly Asp 340 <210> 37 <211> 343 <212> PRT <213> Artificial Sequence <220>

<223> Description of Artificial Sequence: mxoxox3

<400> 37

Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Ile
1 5 10 15

Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Asp Met Phe Arg 20 25 30

Asp Arg Gln Ala Phe Ser Glu His Thr Trp Lys Met Leu Leu Ser Val 35 40 45 Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu Asn Asn Arg Lys Trp Phe Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Leu Leu Tyr Leu Gln Ala Arq Gly Leu Ala Val Lys Thr Ile Gln Gln His Leu Gly Gln Leu Asn Met Leu His Arq Arq Ser Gly Leu Pro Arg Pro Ser Asp Ser Asn Ala Val Ser Leu Val Met Arg Arg Ile Arg Lys Glu Asn Val Asp Ala Gly Glu Arq Ala Lys Gln Ala Leu Ala Phe Glu Arg Thr Asp Phe Asp Gln Val Arg Ser Leu Met Glu Asn Ser Asp Arg Cys Gln Asp Ile Arg Asn 150 155 Leu Ala Phe Leu Gly Ile Ala Tyr Asn Thr Leu Leu Arg Ile Ala Glu Ile Ala Arg Ile Arg Val Lys Asp Ile Ser Arg Thr Asn Gly Gly Arg Met Leu Ile His Ile Ser Arg Thr Lys Thr Leu Val Ser Thr Ala Gly Val Glu Lys Ala Leu Ser Leu Gly Val Thr Lys Leu Val Glu Gln Trp Ile Ser Val Ser Gly Val Ala Asp Asp Pro Asn Asn Tyr Leu Phe Cys Arg Val Arg Lys Asn Gly Val Ala Ala Pro Ser Ala Thr Ser Arg Leu

ant

Ser Thr Arg Ala Leu Gly Gly Ile Phe Glu Ala Thr His Arg Leu Ile

Tyr Gly Ala Lys Asp Asp Ser Gly Gln Arg Tyr Leu Ala Trp Ser Gly
275 280 285

His Ser Ala Arg Val Gly Ala Ala Arg Asp Met Ala Arg Ala Gly Val

Ser Ile Leu Glu Ile Met Gln Ala Gly Gly Trp Thr Asn Val Asn Ile 305 310 315 320

Val Met Asn Tyr Ile Arg Asn Leu Asp Ser Glu Thr Gly Ala Met Val 325 330 335

Arg Leu Leu Glu Asp Gly Asp 340

<210> 38

<211> 343

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: mxoxox4

<400> 38

Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Val 1 5 10

Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Asp Met Phe Arg 20 25 30

Asp Arg Gln Ala Phe Ser Glu His Thr Trp Lys Met Leu Leu Ser Val\$35\$ 40 45

Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu Asn Asn Arg Lys Trp Phe 50 55 60

Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Leu Leu Cys Leu Gln Ala 65 70 75 80

Arg Gly Leu Ala Val Lys Thr Ile Gln Gln His Leu Gly Gln Leu Asn 85 90 95

Met Leu His Arg Arg Ser Gly Leu Pro Arg Pro Ser Asp Ser Asn Ala 100 105 110

Val Ser Leu Val Met Arg Arg Ile Arg Lys Glu Asn Val Asp Ala Gly
115 120 125

Glu Arg Ala Lys Gln Ala Leu Ala Phe Lys Arg Thr Asp Phe Asp Gln 130 135 140

Val Arg Ser Leu Met Glu Asn Ser Asp Arg Cys Gln Asp Ile Arg Asn

ant

145

Leu Ala Phe Leu Gly Ile Ala Tyr Asn Thr Leu Leu Arg Ile Ala Glu 165 170 175

Ile Ala Arg Ile Arg Val Lys Asp Ile Ser Arg Thr Asp Gly Gly Arg
180 185 190

Met Leu Ile His Ile Gly Arg Thr Lys Thr Leu Val Ser Thr Ala Gly
195 200 205

Val Glu Lys Ala Leu Ser Leu Gly Val Thr Lys Leu Val Glu Arg Trp 210 215 220

Ile Ser Val Ser Gly Val Ala Asp Asp Pro Asn Asn Tyr Leu Phe Cys 225 230 230 235 240

Arg Val Arg Lys Asn Gly Val Ala Ala Pro Ser Ala Thr Ser Gln Leu 245 250 255

Ser Thr Arg Ala Leu Glu Gly Ile Phe Glu Ala Thr His Arg Leu Ile 260 265 270

Tyr Gly Ala Lys Asp Asp Ser Gly Gln Arg Tyr Gln Ala Trp Ser Gly 275 280 285

His Ser Ala Arg Val Gly Ala Ala Arg Asp Met Ala Arg Ala Gly Val 290 295 300

Ser Ile Pro Glu Ile Met Gln Ala Gly Gly Trp Thr Asn Val Asn Ile 305 310 315 320

Val Met Asn Tyr Ile Arg Asn Leu Asp Ser Glu Thr Gly Ala Met Val 325 330 335

Arg Leu Leu Glu Asp Gly Asp 340

<210> 39

<211> 343

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: mxoxox5

<400> 39

Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Val Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Ala Met Phe Arg Asp Arg Gln Ala Phe Ser Glu His Thr Trp Lys Met Leu Leu Ser Val Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu Asn Asn Arg Lys Trp Phe Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Leu Leu Tyr Leu Gln Ala Arg Gly Leu Ala Val Lys Thr Ile Gln Gln His Leu Gly Gln Leu Asn Met Leu His Arg Gln Ser Gly Leu Pro Arg Pro Ser Asp Ser Asn Ala Val Ser Leu Val Met Arg Arg Ile Arg Lys Glu Asn Val Asp Ala Gly Glu Arg Ala Lys Gln Ala Leu Ala Phe Glu Arg Thr Asp Phe Asp Gln Val Arg Ser Leu Met Glu Asn Ser Asp Arg Cys Gln Asp Ile Arg Asn Leu Ala Phe Leu Gly Ile Ala Tyr Asn Thr Leu Leu Arg Ile Ala Glu Ile Ala Arg Ile Arg Val Lys Asp Ile Ser Arg Thr Asp Gly Gly Arg Met Leu Ile His Ile Gly Arg Thr Lys Thr Leu Val Ser Thr Ala Gly Val Glu Lys Ala Leu Ser Leu Gly Val Thr Lys Gln Val Glu Arg Trp Ile Ser Val Ser Gly Val Ala Asp Asp Pro Asn Asn Tyr Leu Phe Cys

Arg Val Arg Lys Asn Gly Val Ala Ala Pro Ser Ala Thr Ser Gln Leu

Ser Thr Arg Ala Leu Gly Gly Ile Phe Glu Ala Thr His Arg Leu Ile 265

Tyr Gly Ala Lys Asp Asp Ser Gly Gln Arg Tyr Leu Ala Trp Ser Gly 275

His Ser Ala Arg Val Gly Ala Ala Arg Asp Met Ala Arg Ala Gly Val

Ser Ile Pro Glu Ile Met Gln Ala Gly Gly Trp Ser Asn Val Asn Ile 305 310 315 320

295

Val Met Asn Tyr Ile Arg Asn Leu Asp Ser Glu Thr Gly Ala Met Val 325 330 335

Arg Leu Leu Glu Asp Gly Asp 340

<210> 40

<211> 343

<212> PRT

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: mxoxox6

<400> 40

Met Ser Asn Leu Leu Thr Val His Gln Asn Leu Pro Ala Leu Pro Val 1 5 10 15

Asp Ala Thr Ser Asp Glu Val Arg Lys Asn Leu Met Asp Met Phe Arg 20 25 30

Asp Arg Gln Ala Phe Ser Glu His Thr Trp Lys Met Leu Leu Ser Val 35 40 45

Cys Arg Ser Trp Ala Ala Trp Cys Lys Leu Asn Asn Arg Lys Trp Phe 50 60

Pro Ala Glu Pro Glu Asp Val Arg Asp Tyr Leu Leu Tyr Leu Gln Ala 65 70 75 80

Arg Gly Leu Ala Val Lys Thr Ile Gln Gln His Leu Gly Gln Leu Asn
85 90 95

Met Leu His Arg Arg Ser Gly Leu Pro Arg Pro Ser Asp Ser Asn Ala 100 105 110 Val Ser Leu Val Met Arg Arg Ile Arg Lys Glu Asn Val Asp Ala Gly Glu Arg Ala Lys Gln Ala Leu Ala Phe Glu Arg Thr Asp Phe Asp Gln Val Arg Ser Leu Met Glu Asn Ser Asp Arg Cys Gln Asp Ile Arg Asn Leu Ala Phe Leu Gly Ile Ala Tyr Asn Thr Leu Leu Arg Ile Ala Glu Ile Ala Arg Ile Arg Val Lys Asp Ile Ser Arg Thr Asp Gly Gly Arg Met Leu Ile His Ile Gly Arg Thr Lys Thr Leu Val Ser Thr Ala Gly Val Glu Lys Ala Leu Ser Leu Gly Val Thr Lys Leu Val Glu Arg Trp Ile Ser Val Ser Gly Val Ala Asp Asp Pro Asn Asn Tyr Leu Phe Cys Arg Val Arg Lys Asn Gly Val Ala Ala Pro Ser Ala Thr Ser Gln Leu Ser Thr Arg Ala Leu Gly Gly Ile Phe Glu Ala Thr His Arg Leu Ile Tyr Gly Ala Lys Asp Asp Ser Gly Gln Arg Tyr Gln Ala Trp Ser Gly His Ser Ala Arg Val Gly Ala Ala Arg Asp Met Ala Arg Ala Gly Val

ant

Ser Ile Pro Glu Ile Met Gln Ala Gly Gly Trp Ser Asn Val Asn Ile 305 310 315 320

Val Met Asn Tyr Ile Arg Asn Leu Asp Ser Glu Thr Gly Ala Met Val 325 330 335

Arg Leu Leu Glu Asp Gly Asp 340

<210> 41

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<211> 13
<212> DNA
<213> Artificial Sequence
<220>
<223> Description of Artificial Sequence: loxP
<220>
<221> misc feature
<222> (6)..(7)
<223> NN is either TT, TG, GT, GG, TC, CC, and AA
<400> 41
                                                                    13
ataacnncgt ata
<210> 42
<211> 13
<212> DNA
<213> Artificial Sequence
<220>
<223> Description of Artificial Sequence: loxK2
<400> 42
                                                                    13
ataacaacgt ata
<210> 43
<211> 13
<212> DNA
<213> Artificial Sequence
<220>
<223> Description of Artificial Sequence: loxK1
<400> 43
                                                                    13
atacctttgt ata
<210> 44
<211> 34
<212> DNA
<213> Artificial Sequence
<220>
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<223> Description of Artificial Sequence: loxP

| <400> 44 ataacttcgt atataccttt ctatagcaag ttat | 34 |
|--|----|
| <210> 45 <211> 34 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: loxK2 | |
| <400> 45 ataacaacgt atataccttt ctatagcttg ttat | 34 |
| <210> 46 <211> 34 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: loxK1 | |
| <400> 46 atacctttgt atataccttt ctatagaaag gtat | 34 |
| <210> 47 <211> 34 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: loxK2 'GG' | |
| <400> 47 ataacggcgt atataccttt ctatagcccg ttat | 34 |
| <210> 48 <211> 34 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: loxk2 'CC' | |

| <400> 48 ataaccccgt atataccttt ctatagcggg ttat | 34 |
|---|-----|
| | |
| <210> 49 | |
| <211> 34 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| <220> | |
| <223> Description of Artificial Sequence: lox K2 'TC' | |
| <400> 49 | |
| ataactcogt atataccttt ctatagogag ttat | 34 |
| | |
| | |
| <210> 50 | |
| <211> 34 <212> DNA | |
| <213> Artificial Sequence | |
| (210) Milliolal Bequence | |
| <220> | |
| <223> Description of Artificial Sequence: lox K2 'GT' | |
| | |
| <400> 50 | |
| ataacgtcgt atataccttt ctatagcacg ttat | 34 |
| | |
| <210> 51 | |
| <211> 34 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| | |
| <220> | |
| <223> Description of Artificial Sequence: lox K2 'TG' | |
| <400> 51 | |
| ataactgcgt atataccttt ctatagccag ttat | 34 |
| | J 1 |
| | |
| <210> 52 | |
| <211> 34 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| <220> | |
| <223> Description of Artificial Sequence: LoxP | |
| or .metrioral bequence. mont | |

| <400> 52 ataacttcgt ataatgtatg ctatacgaag ttat | 34 |
|---|----------|
| <210> 53 <211> 34 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: Lox K1 | |
| <400> 53 gagcctttgt atataccttt ctatacaaag gctt | 34 |
| <210> 54 <211> 34 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: lox K2 | |
| <400> 54 gatacaacgt atataccttt ctatacgttg tatt | 34 |
| <210> 55 <211> 64 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: Gene | |
| <400> 55 gctagcgaat tcgagcttcg gtacccgggg atcctctaga gtcgacctgc aggcatgcaa gctt | 60 64 |
| <210> 56 <211> 33 <212> DNA <213> Artificial Sequence | |
| <220> <223> Description of Artificial Sequence: | |

oligonucleotide

| <400> 56 | |
|--|----|
| agcttggagg ctatcatgtc gaccaagcta gca | 33 |
| | |
| <210> 57 | |
| <211> 33 | |
| <212> DNA <213> Artificial Sequence | |
| 1213/ Altilicial Sequence | |
| <220> | |
| <223> Description of Artificial Sequence: | |
| oligonucleotide | |
| <400> 57 | |
| gatctgctag cttggtcgac atgatagcct cca | 33 |
| | |
| | |
| <210> 58 <211> 35 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| | |
| <220> | |
| <223> Description of Artificial Sequence: | |
| oligonucleotide | |
| <400> 58 | |
| gatctgatat ctgcggccgc tgacgtgact cgagt | 35 |
| | |
| <210> 59 | |
| <211> 35 | |
| <212> DNA | |
| <213> Artificial Sequence | |
| <220> | |
| <pre><223> Description of Artificial Sequence:</pre> | |
| oligonucleotide | |
| | |
| <400> 59 | |
| ctagactcga gtcacgtcag cggccgcaga tatca | 35 |
| | |
| <210> 60 | |
| <211> 13 | |

<212> DNA

| <213> | Artificial Sequence | | |
|----------------|---|-----------|----|
| <220> <223> | Description of Artificial oligonucleotide | Sequence: | |
| <400> | 60 | | |
| gaagtt | ccta ttc | | 13 |
| | | | |
| <210> | 61 | | |
| <211> | 8 | | |
| <212> | DNA | | |
| <213> | Artificial Sequence | | |
| <000× | | | |
| <220> | Description of Artificial | Saguanga | |
| \223 <i>/</i> | oligonucleotide | sequence. | |
| | | | |
| <400> | 61 | | |
| tctaga | aa | | 8 |
| | | | |
| <210> | 62 | | |
| <211> | | | |
| <212> | | | |
| <213> | Artificial Sequence | | |
| | | | |
| <220> | | | |
| <223> | Description of Artificial oligonucleotide | Sequence: | |
| | oligonacieotide | | |
| <400> | 62 | | |
| gtataç | gaac ttc | | 13 |
| | | | |
| <210> | 63 | | |
| <211> | | | |
| <212> | | | |
| | Artificial Sequence | | |
| | | | |
| <220> | | | |
| <223> | Description of Artificial | Sequence: | |
| | oligonucleotide | | |
| <400> | 63 | | |
| <4UU> | UD | | |

gaagttccta ttccgaagtt cctattc

| <210><211><211><212><213> | 6 | |
|---------------------------|---|----|
| <220> <223> | Description of Artificial Sequence: oligonucleotide | |
| <400> tctaga | | 6 |
| <210><211><211><212><213> | 1.3 | |
| <220> <223> | Description of Artificial Sequence: oligonucleotide | |
| <400> gaagtt | 65 ccata ttc | 13 |
| <210><211><211><212><213> | 13 | |
| <220> <223> | Description of Artificial Sequence: oligonucleotide | |
| <400> gtatat | 66 Egaac ttc | 13 |
| <210><211><212><212><213> | 13 | |
| <400> | 67 | |

gaagttacta ttc

gtatagtaac ttc